

Use on projects with any Base Aggregate Open Graded or Base Aggregate Dense bid items. For dense graded, apply to all grades except reclaimed asphaltic pavement. Apply to all open graded base aggregates. Do not apply to the Aggregate Detours, Salvaged Asphaltic Pavement Base, Breaker Run, Select Crushed, Pit Run, Subbase, or Riprap bid items.

301-010

QMP Base Aggregate.

A Description

A.1 General

- (1) This special provision describes contractor quality control (QC) sampling and testing for base aggregates, documenting those test results, and documenting related production and placement process changes. This special provision also describes department quality verification (QV), independent assurance (IA), and dispute resolution.
- (2) Conform to standard spec 301, 305, and 310 as modified here in this special provision. Apply this special provision to material placed under all of the Base Aggregate Dense and Base Aggregate Open Graded bid items, except do not apply this special provision to material classified as reclaimed asphaltic pavement placed under the Base Aggregate Dense bid items.
- (3) Do not apply this special provision to material placed under the Aggregate Detours, Salvaged Asphaltic Pavement Base, Breaker Run, Select Crushed, Pit Run, Subbase, or Riprap bid items.
- (4) Provide and maintain a quality control program, defined as all activities related to and documentation of the following:
 1. Production and placement control and inspection.
 2. Material sampling and testing.
- (5) Chapter 4 of the department's construction and materials manual (CMM) provides additional detailed guidance for QMP work and describes required sampling and testing procedures. The contractor may obtain the CMM from the department's web site at:
<http://roadwaystandards.dot.wi.gov/standards/cmm/index.htm>

A.2 Contractor Testing for Small Quantities

- (1) The department defines a small quantity, for each individual Base Aggregate bid item, as a plan quantity of 9000 tons (9000 Mg) or less of material as shown in the schedule of items under that bid item.
- (2) The requirements under this special provision apply equally to a small quantity for an individual bid item except as follows:
 1. The contractor need not submit a full quality control plan but shall provide an organizational chart to the engineer including names, telephone numbers and current certifications of all persons involved in the quality control program for material under affected bid items.
 2. Divide the aggregate into uniformly sized sublots for testing as follows:

PLAN QUANTITY	MINIMUM REQUIRED TESTING
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≤ 1500 tons (1500 Mg)	One test from production, load-out, or placement at the contractor's option.
> 1500 tons (1500 Mg) and ≤ 6000 tons (6000 Mg)	Two tests of the same type, either from production, load-out, or placement at the contractor's option.
> 6000 tons (6000 Mg) and ≤ 9000 tons (9000 Mg)	Three placement tests ^{[1] [2]}

^[1] For 3-inch material, obtain samples at load-out.

^[2] If the actual quantity overruns 9000 tons (9000 Mg), create overrun sublots to test at a rate of one additional placement test for each 3000 tons (3000 Mg), or fraction of 3000 tons (3000 Mg), of overrun.

3. No control charts are required. Submit aggregate test results to the engineer within one business day of obtaining the sample. Assure that all properties are within the limits specified in the standard specifications for each test.
 4. Department verification testing is optional for quantities of 6000 tons (6000 Mg) or less.
- (3) Material represented by a subplot with any property outside the specification limits is nonconforming. The department may reject material or otherwise determine the final disposition of nonconforming material as specified in standard spec 106.5.

B Materials

B.1 Quality Control Plan

- (1) Submit a comprehensive written quality control plan to the engineer at or before the pre-construction meeting. Do not place base before the engineer reviews and comments on the plan. Construct the project as that plan provides.
- (2) Do not change the quality control plan without the engineer's review. Update the plan with changes as they become effective. Provide a current copy of the plan to the engineer and post in each of the contractor's laboratories as changes are adopted. Ensure that the plan provides the following elements:
 1. An organizational chart with names, telephone numbers, current certifications and/or titles, and roles and responsibilities of QC personnel.
 2. The process used to disseminate QC information and corrective action efforts to the appropriate persons. Include a list of recipients, the communication means that will be used, and action time frames.
 3. A list of source and processing locations, section and quarter descriptions, for all aggregate materials requiring QC testing.
 4. Test results for wear, sodium sulfate soundness, freeze/thaw soundness, and plasticity index of all aggregates requiring QC testing. Obtain this information from the region materials unit or from the engineer.
 5. Descriptions of stockpiling and hauling methods.
 6. Locations of the QC laboratory, retained sample storage, and where control charts and other documentation is posted.

7. An outline for resolving a process control problem. Include responsible personnel, required documentation, and appropriate communication steps.

B.2 Personnel

- (1) Have personnel certified under the department's highway technician certification program (HTCP) perform sampling and testing as follows:

Required certification Level:	Sampling or Testing Roles:
Aggregate Technician IPP Aggregate Sampling Technician Assistant Certified Technician (ACT)	Aggregate Sampling ^[1]
Aggregate Technician IPP Assistant Certified Technician (ACT)	Aggregate Gradation Testing, Aggregate Fractured Particle Testing Aggregate Permeability Testing

^[1] Plant personnel under the direct observation of an aggregate technician certified at level one or higher may operate equipment to obtain samples.

- (2) Ensure that sampling and testing by an assistant certified technician conforms to all of the following:
 1. Sampling by an ACT is done under the direct observation of a aggregate technician certified at level one or higher.
 2. Testing by an ACT is done under the direct supervision of an aggregate technician certified at level one or higher
 3. No more than one ACT reports to an individual certified technician.
- (3) Have an aggregate technician certified at level one or higher perform all data analysis and posting.

B.3 Laboratory

- (1) Perform QC testing at a department qualified laboratory. Obtain information on the Wisconsin laboratory qualification program from:
 Materials Management Section
 3502 Kinsman Blvd.
 Madison, Wisconsin 53704
 Telephone: 608-246-5388
<http://www.dot.state.wi.us/business/engrserv/lab-qualification.htm>

B.4 Quality Control Documentation

B.4.1 General

- (1) Submit base aggregate production and placement documentation to the engineer within 10 business days after completing base placement. Ensure that the submittal is complete, neatly organized, and includes applicable project records and control charts. If conducting post-production testing, also include post-production documentation.

B.4.2 Records

- (1) Document all production and placement observations, inspection records, and control adjustments daily in a permanent field record. Also include all test results in the project records. Provide test results to the engineer within 6 hours after obtaining a sample. For 3-inch base, extend this 6-hour limit to 24 hours. Post or distribute tabulated results using a method mutually agreeable to the engineer and contractor.

B.4.3 Control Charts

- (1) Plot gradation, permeability, and fracture on the appropriate control chart as soon as test results are available. Format control charts according to CMM 4-15-12. Include the project number on base placement control charts. Maintain separate control charts for each base aggregate size, source or classification, and type.
- (2) Provide control charts to the engineer within 6 hours after obtaining a sample. For 3-inch base, extend this 6-hour limit to 24 hours. Post or distribute charts using a method mutually agreeable to the engineer and contractor. Update control charts daily to include the following:
 1. Contractor individual QC tests.
 2. Department QV tests.
 3. Department IA tests.
 4. Four-point running average of the QC tests.
- (3) Except as specified under B.8.2.1 for out-of-tolerance QV tests, include only QC tests in the running average. The contractor may plot process control or informational tests on control charts, but do not include these tests, in-tolerance QV tests, or IA tests in the running average.

B.5 Contractor Testing

B.5.1 Production Testing

- (1) Test gradation and fracture during production of each base aggregate size, source or classification, and type. Sample from either the finished product conveyor belt or stockpiles using the same procedure throughout the project. Determine random sample locations according to CMM 4-15-12 and collect samples according to CMM 4-25-50.
- (2) Test gradation once per 1500 tons (1500 Mg) during initial production from a source, or if switching to a new base aggregate size or classification. For 3-inch base, test once per 3000 tons (3000 Mg) up to a maximum of 2 tests per day during initial production. Test at the initial frequency until 3 consecutive running average points for all the gradation sieves are within the warning limits. Subsequently, the contractor may reduce the frequency to one test per day if all gradation running averages remain within the warning limits. If any gradation running average is outside the warning limits, resume testing at the initial frequency.
- (3) Test fracture for each gradation test until the fracture running average is above the lower warning limit. Subsequently, the contractor may reduce the frequency to one test per 10 gradation tests if the fracture running average remains above the warning limit.

- (4) Provide production test records for aggregate produced before the contract. The engineer will review this documentation to determine if testing conforms to the contract. The engineer may reject material if testing is nonconforming. The engineer may subsequently approve this material for placement if the contractor provides additional post-production test results, as specified in B.5.2, to supplement otherwise nonconforming testing.

B.5.2 Post-Production Testing

B.5.2.1 Stockpile 3-Test Averages

- (1) Collect 3 random samples from each stockpile not adequately tested during production. Test each sample for fracture and gradation. Calculate a 3-test average for fracture and for the percent passing each sieve. The engineer will determine additional requirements as follows:
1. If the fracture 3-test average or any gradation 3-test average exceeds its respective warning limits, the engineer will reject the stockpile unless the contractor elects to rework it. If electing to rework the stockpile, test the material during reworking as required for production testing under B.5.1. Plot the reworking test results on a separate control chart. Include the 3-test averages and their component individual tests on that control chart, but do not include them in the running average. No load-out testing is required.
 2. If the fracture 3-test average and all the gradation 3-test averages fall within their respective warning limits, the engineer will approve the stockpile subject to load-out testing. Conduct and document additional testing during load-out as specified in B.1.5.2.2. Include the 3-test averages and their component individual tests on the load-out control chart, but do not include them in the running average.

B.5.2.2 Load-Out Testing

- (1) For stockpiles approved without reworking under B.5.2.1, test gradation and fracture during load-out as follows:

DAILY LOAD-OUT in tons or Mg	TESTS PER DAY
≥500 to <1500	1
≥1500	2

- (2) Plot the load-out test results on a separate control chart.
- (3) Test fracture for each gradation test until the fracture running average is above the lower warning limit. Subsequently, the contractor may reduce the frequency to one test per 10 gradation tests if the fracture running average remains above the warning limit.
- (4) Stop placing material if any load-out running average exceeds its warning limits. Collect 3 random samples from the remaining stockpile. The engineer will evaluate the remaining stockpile as specified in B.5.2.1. Proceed with post-production testing of the remaining stockpile as specified in B.5.2.1.

B.5.3 Placement Testing

- (1) Test gradation and fracture during placement for each base aggregate size, source or classification, and type. The contractor may test permeability of open graded base instead of gradation, but must then use permeability testing throughout the project. The engineer will not require fracture testing if all production running averages are above the warning limit. The engineer may reinstate fracture testing if verification tests fall below the warning limit.
- (2) Determine random sample locations according to CMM 4-15-12 and collect samples from the grade according to CMM 4-25-50. Each day before placement, have an aggregate technician determine random sample locations based on the contractor's estimate for that day's placement quantity and provide those sample locations to the engineer. Obtain samples after the material has been bladed, mixed, and shaped but before compacting; except collect 3-inch samples from the stockpile at load-out. Do not sample from material used to maintain local traffic or from areas of temporary base that will not have an overlying pavement. On days when placing only material used to maintain local traffic or only temporary base that will not have an overlying pavement, no placement testing is required.
- (3) Split each contractor QC sample and identify it according to CMM 4-15-12. Retain the split for 7 calendar days in a dry, protected location. If requested for department comparison testing, deliver the split to the engineer within one business day.
- (4) Test gradation or permeability once per 3000 tons (3000 Mg) of estimated placement up to a maximum of 3 tests per day, or one sample per 5 days of placement whichever is most frequent. Include unsampled material in the estimate for the next day's placement as follows:
 1. If actual placement falls short of a planned random test location.
 2. If actual placement over runs and less than 3 tests are made that day.
- (5) The engineer may require additional sampling and testing to evaluate suspect material or the technician's sampling and testing procedures.
- (6) If required, test fracture for each gradation or permeability test until the fracture running average is above the lower warning limit. Subsequently, the contractor may reduce the frequency to one test per 10 gradation or permeability tests if the fracture running average remains above the warning limit.

B.6 Test Methods

B.6.1 Gradation

- (1) Test gradation using a washed analysis conforming to the following as modified in CMM 4-25-50:

Gradation	AASHTO T 27
Material finer than the No. 200 (75 μ m) sieve	AASHTO T 11
- (2) For 3-inch base, if 3 consecutive running average points for the percent passing the No. 200 (75 μ m) sieve are 8.5 percent or less, the contractor may use an unwashed analysis.

Wash at least one sample out of 10. If a single running average for the percent passing the No. 200 (75 μ m) sieve exceeds 8.5 percent, resume washed analyses until 3 consecutive running average points are again 8.5 percent passing or less.

- (3) Maintain a separate control chart for each sieve size specified in standard spec 305 or 310 for each base aggregate size, source or classification, and type. Set control and warning limits based on the standard specification gradation limits as follows:
 1. Control limits are at the upper and lower specification limits.
 2. There are no upper warning limits for sieves allowing 100 percent passing and no lower control limits for sieves allowing 0 percent passing.
 3. Dense graded warning limits, except for the No. 200 (75 μ m) sieve, are 2 percent within the upper and lower control limits. Warning limits for the No. 200 (75 μ m) sieve are set 0.5 percent within the upper and lower control limits.
 4. Open graded warning limits for the 1-inch (25.0 mm), 3/8-inch (9.5 mm), and No. 4 (4.75 mm) sieves are 2 percent within the upper and lower control limits. Upper warning limits for the No. 10 (2.00 mm), No. 40 (425 μ m), and No. 200 (75 μ m) sieves are 1 percent inside the upper control limit.

B.6.2 Fracture

- (1) Test fracture conforming to CMM 4-25-50. The engineer will waive fractured particle testing on quarried stone.
- (2) Maintain a separate fracture control chart for each base aggregate size, source or classification, and type. Set the lower control limit at the contract specification limit, either specified in another special provision or in table 301-2 of standard spec 301.2.3.5. Set the lower warning limit 2 percent above the lower control limit. There are no upper limits.

B.6.3 Permeability

- (1) Test permeability using equipment and procedures conforming to the department's falling head permeameter test as described in CMM 4-15-32.
- (2) The individual test specification limit is a minimum of 700 feet/day (200 m/day). An individual test is the average of 3 permeability test values from a single sample (K_n).
- (3) Maintain a separate permeability control chart for each open graded base source. Set the running average lower control limit at 1000 feet/day (300 m/day). Set the running average lower warning limit at 1300 feet/day (400 m/day). There are no upper limits.

B.7 Corrective Action

B.7.1 General

- (1) Consider corrective action when the running average trends toward a warning limit. Take corrective action if an individual test exceeds the contract specification limit. Document all corrective actions both in the project records and on the appropriate control chart.

B.7.2 Production Corrective Action

- (1) Take corrective action if the running average exceeds a warning limit. Part of this required corrective action is a return to the initial testing frequencies specified in B.1.5.1. The contractor may subsequently reduce the frequency if conditions specified for reduced frequency testing under B.5.1 are met.

B.7.3 Placement Corrective Action

- (1) Do not blend additional material on the roadbed to correct gradation or permeability problems.
- (2) Notify the engineer whenever the running average exceeds a warning limit. When 2 consecutive running averages exceed a warning limit, the engineer and contractor will discuss appropriate corrective action. Perform the engineer's recommended corrective action and increase the testing frequency as follows:
 1. For gradation or permeability, increase the QC testing frequency to at least one randomly sampled test per 1000 tons (1000 Mg) placed.
 2. For fracture, increase the QC testing frequency to at least one test per gradation or permeability test.
- (3) If corrective action improves the property in question such that the running average after 4 additional tests is within the warning limits, the contractor may return to the testing frequency specified in B.5.3. If corrective action does not improve the property in question such that the running average after 4 additional individual tests is still in the warning band, repeat the steps outlined above starting with engineer notification.
- (4) If the running average exceeds a control limit, material starting from the first running average exceeding the control limit and ending at the first subsequent running average inside the control limit is nonconforming and subject to pay reduction.
- (5) For individual test results significantly outside the control limits, notify the engineer, stop placing base, and suspend other activities that may affect the area in question. The engineer and contractor will jointly review data, data reduction, and data analysis; evaluate sampling and testing procedures; and perform additional testing as required to determine the extent of potentially unacceptable material. The engineer may direct the contractor to remove and replace that material. Individual test results are significantly outside the control limits if meeting one or more of the following criteria:
 1. A gradation control limit for any sieve is exceeded by more than 5 percent.
 2. Permeability is less than 700 feet/day (200 m/day).
 3. The fracture control limit is exceeded by more than 10 percent.

B.8 Department Testing

B.8.1 General

- (1) The department will conduct verification testing to validate the quality of the product and independent assurance testing to evaluate the sampling and testing. The department will provide the contractor with a listing of names and telephone numbers of all QV and IA personnel for the project, and provide test results to the contractor within 2 business days after the department obtains the sample.

B.8.2 Verification Testing**B.8.2.1 General**

- (1) The department will have an HTCP technician, or ACT under the direction of a certified technician, perform QV sampling and testing. Department verification testing personnel must meet the same certification level requirements specified in B.2 for contractor testing personnel for each test result being verified. The department will notify the contractor before sampling so the contractor can observe QV sampling.
- (2) The department will conduct QV tests of each base aggregate size, source or classification, and type during placement conforming to the following:
 1. One non-random test on the first day of placement.
 2. At least one random test per 30,000 tons (30 000 Mg), or fraction of 30,000 tons (30 000 Mg), placed.
- (3) The department will sample randomly, at locations independent of the contractor's QC work, collecting one sample at each QV location. The department will collect QV samples after the material has been bladed, mixed, and shaped but before compacting; except, for 3-inch aggregates, the department will collect samples from the stockpile at load-out. The department will split each sample, test half for QV, and retain half.
- (4) The department will conduct QV tests in a separate laboratory and with separate equipment from the contractor's QC tests. The department will use the same methods specified for QC testing. If the contractor chooses permeability for QC testing, the department will use permeability for QV testing.
- (5) The department will assess QV results by comparing to the appropriate specification limits. If QV test results conform to the specification, the department will take no further action. If QV test results are nonconforming, the engineer will compare those results to the nearest previous QC test result as follows:
 1. If the QV and QC results are within the tolerances specified in B.8.2.2, the department will take no further action.
 2. If QV and QC results are not within the tolerances specified in B.8.2.2, add the QV to the QC test results as if it were an additional QC test.

B.8.2.2 Verification Testing Tolerances

- (1) Differences between the contractor's QC test results and the department's QV test results are acceptable if within the following tolerances:

TEST PROPERTY	ACCEPTABLE DIFFERENCE
GRADATION	
1 in (25.0 mm)	±6 % passing
3/4 in (19.0 mm)	±6 % passing
3/8 in (9.5 mm)	±6 % passing
No. 4 (4.75 mm)	±5 % passing
No. 8 (2.36 mm)	±4 % passing
No. 10 (2.00 mm)	±4 % passing
No. 30 (600 µm)	±4 % passing
No. 40 (425 µm)	±4 % passing
No. 50 (300 µm)	±4 % passing
No. 200 (75 µm)	±2 % passing
PERMEABILITY	±20 % of the measured QV permeability
FRACTURE	±10 % of the measured QV fracture

B.8.3 Independent Assurance

- (1) Independence assurance is unbiased testing the department performs to evaluate the department's QV and the contractor's QC sampling and testing including personnel qualifications, procedures, and equipment. The department will perform an IA review according to the department's independent assurance program. That review may include one or more of the following:
 1. Split sample testing.
 2. Proficiency sample testing.
 3. Witnessing sampling and testing.
 4. Test equipment calibration checks.
 5. Reviewing required worksheets and control charts.
 6. Requesting that testing personnel perform additional sampling and testing.
- (2) If the department identifies a deficiency, and after further investigation confirms it, correct that deficiency. If the contractor does not correct or fails to cooperate in resolving identified deficiencies, the engineer may suspend placement until action is taken. Resolve disputes as specified in B.9.

B.9 Dispute Resolution

- (1) The engineer and contractor should make every effort to avoid conflict. If a dispute between some aspect of the contractor's and the engineer's testing program does occur, seek a solution mutually agreeable to the project personnel. The department and contractor may review the data, examine data reduction and analysis methods, evaluate sampling and testing procedures, and perform additional testing. Use ASTM E 178 to evaluate potential statistically outlying data.
- (2) If the project personnel cannot resolve a dispute, and the dispute affects payment or could result in incorporating nonconforming product, the department will use third party testing to resolve the dispute. The department's central office laboratory, or a mutually agreed on independent testing laboratory, will provide this testing. The engineer and contractor will

abide by the results of the third party tests. The party in error will pay service charges incurred for testing by an independent laboratory. The department may use third party test results to evaluate the quality of questionable materials and determine the appropriate payment. The department may reject material or otherwise determine the final disposition of nonconforming material as specified in standard spec 106.5.

B.10 Acceptance

- (1) The department will accept base aggregate based on the contractor QC tests unless it is shown through the verification or the dispute resolution process that the contractor's test results are in error.

C (Vacant)

D (Vacant)

E Payment

- (1) Costs for all sampling, testing, and documentation required under this special provision are incidental to this work. If the contractor fails to perform the work required under this special provision, the department may reduce the contractor's pay. The department will administer pay reduction under the Non-performance of QMP administrative item.
- (2) For material represented by a running average exceeding a control limit, the department will reduce pay by 10 percent of the contract price for the affected Base Aggregate bid items listed in subsection A. The department will administer pay reduction under the Nonconforming QMP Base Aggregate Gradation or Nonconforming QMP Base Aggregate Fracture administrative items. The department will determine the quantity of nonconforming material as specified in B.7.3.

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